



20 October 2017

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Our ref: 2219058-21409
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Dear Radu

PFAS Contamination Assessment – Summary Report Western Mines Rescue Station, Lithgow

1 Introduction

GHD Pty Ltd (GHD) was engaged to assess the potential for per- and poly-fluoroalkyl substances (PFAS) contamination at the Mines Rescue facility located at 3 Proto Avenue, Lithgow NSW 2790 (the Site). The Site location and site layout is presented in Figures 1 and 2, Attachment A.

NSW Environment Protection Authority (EPA) has established a program of sampling to investigate the extent of PFAS contamination across the state as part of a broader precautionary approach to manage the legacy of PFAS use in NSW. To date, sampling completed by the EPA has focused primarily on sites which have been identified as having the greatest potential use of PFAS containing products including airports, fire fighting training facilities and some industrial sites.

The Site has historically been used and owned by Mines Rescue Pty Limited (Mines Rescue), a subsidiary of Coal Services Pty Limited (Coal Services), for the training of mine personnel in emergency response and rescue procedures, which included the use of aqueous film forming foams (AFFF). The foams used may have contained PFAS including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment. It is understood that AFFF was in general use for fire fighting training at Mines Rescue facilities from the 1970's until AFFF was banned by Mines Rescue and its use discontinued by 2002. In May 2017, evidence of PFAS impact was identified in shallow soils at Mines Rescue sites in Argenton and Singleton Heights.

Given the history of use of AFFF at the Site, Mines Rescue required investigations to be completed to assess the potential extent of PFAS contamination at the Site.

GHD completed a desktop review and intrusive site investigations between June and September 2017. Details of the works undertaken and the outcomes of the investigations are presented in GHD's report *Western Mines Rescue Station, Lithgow NSW, PFAS Contamination Assessment, October 2017*.

This letter provides a summary of the findings of the investigations completed by GHD and should be read in conjunction with the GHD (2017) report and the limitations presented in Section 10 of this letter report.

2 Objectives and scope of works

The overall objective of the investigation was to understand the extent of PFAS contamination at the Site and to assess the potential risks to human health and key environmental receptors.

To address the investigation objectives outlined above, this assessment was designed to assess:

- Whether PFAS impacted groundwater is present on-site and if it has potentially migrated off-site at concentrations which may pose a risk to human health and/or the environment
- Whether PFAS impacted soils are present on-site at concentrations which may pose a risk to human health or the environment
- The potential for off-site migration of PFAS via surface water drainage

The scope of work comprised:

- Desktop review of available information
- Site inspection and interviews with site personnel to gain an understanding of current site conditions, ground truth information obtained during the desktop review and to understand historical training practices used at the Site
- Collection of soils from eight hand auger locations (HA1 to HA8) targeting former fire training areas and aimed at delineating surface water runoff effects on impacting down gradient soils
- Drilling and installation of three on-site groundwater monitoring wells (MW1 to MW3) and collection and analysis of six soil samples from these boreholes
- Collection of three sediment samples (Pool 1, Gallery Pit 1 and Tank 1) of the internal drainage system discharging to sewer and three sediment samples (SW Pit 1, SW Pit 4 and Drain 1) of the external training system discharging to stormwater
- Sampling of four water samples (Pool 1, Gallery Pit 1, Tank 1 and Separator 1) of the internal drainage system discharging to sewer and three water (SW Pit 1, SW Pit 4 and Drain 1) of the external drainage system discharging to stormwater
- Collection of groundwater samples from the three newly installed groundwater wells
- Preparation of a report summarising the findings of the desktop review and intrusive investigations (GHD, 2017)

3 Site history

The Site has historically been used by Mines Rescue for the training of mine personnel in emergency response and rescue procedures, including the use of AFFF which may have contained PFAS.

GHD understands that AFFF was in general use for fire fighting training at Mines Rescue facilities from the 1970's until AFFF was banned by Mines Rescue and its use discontinued by 2002. Training exercises at the Site occurred both outdoors and within purpose built training facilities such as the gallery and fire cell. During training, fire fighting foams were used inside the gallery, the fire cell and outside in the vicinity of the fire cell in the area either to the north aiming back toward the fire cell or within the north western grassed area of the Site. Training occurred approximately once a fortnight inside and approximately once or twice a year outside.

4 Sampling program and rationale

The sampling program was based on the preliminary Conceptual Site Model (CSM) which was developed based on the findings of the desktop review (GHD, 2017). Table 4-1 summarises the sampling program and rationale. In summary, the following activities were conducted in August 2017:

- 8 to 10 August 2017:
 - Installation of three groundwater wells and associated soil sampling (MW01 to MW03)
 - Sampling of soils from eight hand auger locations (HA01 to HA08)
 - Collection of four surface water samples (Pool 1, Gallery Pit 1, Tank 1 and Separator 1) and three sediment samples (Pool 1, Gallery Pit 1 and Tank 1) of the internal training system discharging to sewer
 - Collection of three water and three sediment samples (SW Pit 1, SW Pit 4 and Drain 1) from the external training system discharging to stormwater
- 22-23 August 2017 – groundwater sampling of monitoring wells (MW01 to MW03)

Sample locations are presented in Figure 3, Attachment A.

Sampling methodologies were completed with reference to the procedures outlined in the Western Australia Department of Environment Regulation (WA DER) 2017 *Interim Guideline on the assessment and management of perfluoroalkyl and polyfluoroalkyl substances Attachment 1* (PFAS specific sample collection methods, equipment and equipment decontamination methods).

Table 4-1 Sampling Program

Matrix	Monitoring location		Rationale	Number of samples	Laboratory analysis *
	ID	Location description			
Soil	MW1 – MW3	Within area of PFAS application	Assess potential PFAS soil impacts.	6	PFAS, ASLP – PFAS (2 samples with highest concentrations)
	HA01-HA08	Within area of PFAS application	Characterise possible impact within surface and subsurface soils within the area of PFAS application.	8	PFAS, ASLP – PFAS (2 samples with highest concentrations)
Groundwater	MW1	Sampling of newly installed groundwater wells	Assess PFAS concentrations on-site. Confirm groundwater flow direction.	3	PFAS
	MW2				
	MW3				
Soil and Sediment	Pool 1 Gallery Pit 1 Tank 1 SW Pit 1 SW PIT 4 Drain 1	In drainage lines and pits within and adjacent to the training areas	Delineate PFAS concentration in soil and sediment within pits and drains on and down gradient from the site.	6	PFAS ASLP – PFAS (2 samples with highest concentrations)
Surface water	Pool 1 Gallery Pit 1 Tank 1 Separator 1 SW Pit 1 SW PIT 4 Drain 1	In drainage lines and pits within and adjacent to the training areas	Assess PFAS concentration in surface water within pits and drains on and down gradient from the site.	7	PFAS

* - PFAS = full suite

5 Results

Analytical results and field parameters are summarised in the following tables in Attachment B:

- Table A: Soil analytical results
- Table B: Groundwater and surface water analytical results and field parameters
- Table C: ASLP analytical results

5.1 Soil and sediment results

A summary of the soil and sediment¹ results are presented in Table 5-1 and Figure 4, Attachment A.

Table 5-1 Summary soil analytical results

	On-site	Off-site
Human health investigation levels	<p>On-site soil samples reported a maximum concentration of PFOS+PFHxS of 0.72 mg/kg, which is greater than an order of magnitude below the health based investigation level of 20 mg/kg.</p> <p>PFOA reported a maximum concentration of 0.040 mg/kg in on-site soils, which is several orders of magnitude below the health based investigation level of 100 mg/kg.</p>	<p>Off-site sample (Drain 1) collected from the drainage line down-gradient of the site reported a maximum concentration of PFOS+PFHxS of 0.0029 mg/kg. Concentrations of PFOA were below the laboratory limit of reporting.</p> <p>Potential for human exposure to off-site soils in drainage lines is considered to be low however it is noted that the concentrations were lower than those reported on-site and orders of magnitude below all human health based investigation levels.</p>
Ecological investigation levels	<p>PFOS was reported at a maximum concentration of 0.697 mg/kg in on-site soils, with the sample collected from MW2, at a depth of 0.15-0.3 m exceeding the ESL (indirect) of 0.14 mg/kg.</p>	<p>Off-site sample (Drain 1) collected from the drainage line down-gradient of the site reported concentrations of PFOS below the nominated ecological screening levels.</p>

5.2 Groundwater and surface water results

A summary of the groundwater and surface water results is presented in Table 5-2 and Table 5-3 and in Attachment A, Figure 5.

¹ sediment samples collected from the internal drainage system on site and drainage lines leaving the site have been classified as soils for the purpose of data interpretation and comparison with available guidelines.

Table 5-2 Summary groundwater results

On-site		Off-site
Groundwater data		
Drinking water guidelines	<p>PFHxS + PFOS: Concentration of 0.31 µg/L reported in MW1, exceeding the drinking water criteria of 0.07 µg/L Concentrations in groundwater at MW2 and MW3 were below the laboratory LOR.</p> <p>PFOA: In all instances, concentrations of PFOA were at or below the laboratory LOR and below the drinking water criteria of 0.56 µg/L.</p>	<i>Not applicable – off-site groundwater samples not collected during these works</i>
Ecological guidelines	<p>PFOS: In all instances, concentrations in groundwater at all locations were below the laboratory LOR and the ecological screening level of 0.13 µg/L).</p> <p>PFOA: Reported below the ecological screening level (220 µg/L) in all on-site groundwater samples.</p>	<i>Not applicable – off-site groundwater samples not collected during these works</i>

Table 5-3 Summary surface water results

	Internal training system to sewer	External training system to stormwater
Drinking water guidelines	<p>PFHxS+PFOS:</p> <ul style="list-style-type: none"> - Reported in water at locations Pool 1, Gallery Pit 1, Tank 1 and Separator 1 at concentrations of 0.55 µg/L, 0.89 µg/L, 3.13 µg/L, and 0.57 µg/L respectively, exceeding the drinking water criteria of 0.07 µg/L. <p>PFOA:</p> <ul style="list-style-type: none"> - In all instances, concentrations of PFOA were below the drinking water criteria of 0.56 µg/L. 	<p>PFHxS+PFOS:</p> <ul style="list-style-type: none"> - Reported in water at locations SW Pit 1 and SW Pit 4 at concentrations of 13.1 µg/L and 7.79 µg/L respectively, exceeding the drinking water criteria of 0.07 µg/L. <p>PFOA:</p> <ul style="list-style-type: none"> - In all instances, concentrations of PFOA were below the drinking water criteria of 0.56 µg/L.
Ecological guidelines	<p>PFOS:</p> <ul style="list-style-type: none"> - Reported in water at locations Pool 1, Gallery Pit 1, Tank 1 and Separator 1 at concentrations of 0.30 µg/L, 0.63 µg/L, 2.27 µg/L, and 0.25 µg/L respectively, exceeding the ecological screening level of 0.13 µg/L. <p>PFOA:</p> <ul style="list-style-type: none"> - Reported below the ecological screening level (220 µg/L) in both on-site surface water samples. 	<p>PFOS:</p> <ul style="list-style-type: none"> - Reported in water at locations SW Pit 1 and SW Pit 4 at concentrations of 8.43 µg/L and 7.03 µg/L respectively, exceeding the ecological screening level of 0.13 µg/L. <p>PFOA:</p> <ul style="list-style-type: none"> - Reported below the ecological screening level (220 µg/L) in both on-site surface water samples.

6 Discussion

Table 6-1 and Table 6-2 present a discussion of results reported during this investigation.

Table 6-1 Summary discussion – soil and sediment results

Media	Summary discussion
Soils on site	<p>Human health:</p> <ul style="list-style-type: none"> No on-site soil samples reported PFAS concentrations exceeding the nominated screening criteria for human health. <p>Ecological receptors:</p> <ul style="list-style-type: none"> One shallow soil sample, collected at location MW2 from a depth of 0.15-0.3 m reported a concentration of PFOS which was above the indirect ecological screening criteria for commercial/industrial land use. This sample was collected from within the central northern portion of the Site near the fire cell in the area where GHD understands training had historically been periodically conducted outside. <p>Surface soils from this location reported a concentration of PFOS which was an order of magnitude lower than underlying the sample (MW2_0.15-0.3) suggesting that PFOS may be migrating through surface soils. The vertical extent of PFOS was not confirmed during this stage of works and underlying samples have not yet been analysed at the time of issue of this draft report but are on hold at the project laboratory for further analyses. It is unlikely however that PFAS if present at depths greater than 0.3 m would present an ecological hazard.</p>
Sediment samples in on site drainage systems discharging to sewer	<p>PFAS were reported in the three sediment samples collected from the onsite surface water infrastructure locations that discharge to sewer (Pool 1, Gallery Pit 1 and Tank 1). However concentrations were below the nominated investigation levels for the protection of both human health and ecological receptors.</p> <p>Sediment sample Tank 1 was selected for ASLP and PFAS was reported in the resultant leachate sample.</p> <p>Whilst the total PFAS concentration in sediments was below the nominated investigation levels, the presence of PFAS in leachate sample Tank 1 indicates the propensity for PFAS to leach into solution from sediments entrapped within infrastructure on the Site and discharge to sewer.</p>

Media	Summary discussion
Samples in on-site drainage systems discharging to stormwater	<p>PFAS were reported in the two sediment samples collected from the onsite surface water infrastructure locations that discharge to stormwater (SW Pit 1 and SW Pit 4) however concentrations were below the nominated investigation levels for the protection of both human health and ecological receptors.</p> <p>Sediment sample SW Pit 1 was selected for ASLP and PFAS was reported in the resultant leachate sample.</p> <p>Whilst the total PFAS concentration in sediments was below the nominated investigation levels, the presence of PFAS in leachate sample SW Pit 1 indicates the propensity for PFAS to leach into solution from sediments entrapped within infrastructure on the Site and potentially discharge to stormwater.</p>
Sediment samples in surface water drainage line down-gradient of the site	<p>Sediment sample Drain 1 was collected from the stormwater drainage line to the north of the site (inferred down-gradient). PFAS were reported in sample Drain 1, however concentrations were below the nominated investigation levels for the protection of both human health and ecological receptors.</p> <p>Sampling location Drain 1 is likely receiving water and sediments discharging from the site via location SW Pit 4. Whilst the data indicates that PFAS has migrated off-site, the concentrations of PFAS in sample Drain 1 were generally an order of magnitude lower than those reported in location SW Pit 4, suggesting concentrations decrease with distance from the Site.</p>

Table 6-2 Summary discussion – Groundwater and surface water

Media	Summary discussion
Groundwater on site	<p>Groundwater well locations were selected to target areas of potential concern and also avoid areas of known underground services or access restrictions. However, the placement of wells in general alignment means that the interpretation of groundwater contour data would not present a reliable estimate of groundwater flow direction. Based on observations made on site and local topography, groundwater would be expected to flow in a general northerly direction.</p> <p>Concentrations of PFAS were detected in two groundwater wells on-site (MW1 and MW2). The highest concentration was reported at MW1 located within the north western portion of the Site, which exceeded the nominated drinking water criteria. No extraction of groundwater for drinking purposes takes place on site.</p>

Media	Summary discussion
Groundwater – potential for off-site migration	<p>PFAS were not reported above the laboratory LOR in groundwater well MW3, located on the northern boundary of the site. In the absence of a detailed understanding of groundwater flow direction, data reported from this location cannot be taken as an indication that PFAS is not migrating off site and further sampling to the north of MW1 would be required to assist with interpretation of groundwater flow direction and delineation of PFAS impact reported in MW1.</p>
Surface water in on-site drainage systems discharging to sewer	<p>PFAS was detected in water samples collected from the on-site surface water collection system, which discharges to sewer.</p> <p>Human Health:</p> <p>Incidental contact with surface water in the drains would not be expected to present an increased risk of adverse health effects.</p> <p>Ecological receptors:</p> <p>The concentration of PFOS was reported above the ecological investigation levels. However, the infrastructure sample locations are not considered to represent an environment suitable for aquatic ecosystems. The presence of PFOS at concentrations above the ecological investigation levels at these locations would therefore not be considered to represent a risk as the surface water is discharged to sewer.</p>
Surface water in on-site drainage systems discharging to stormwater	<p>PFAS was detected in water samples collected from the on-site surface water collection system, which discharges to stormwater. The concentration of PFOS + PFHxS was highest at location SW Pit 1 (13.1 µg/L) which was located in the central portion of the site, in the general vicinity of the fire cell. Sample SW Pit 4 reported a concentration of PFOS + PFHxS of 7.79 µg/L. Whilst the connection between SW Pit 1 and SW Pit 4 has not been confirmed, based on site observations, GHD assumes that these locations are connected and water in SW Pit 1 flows into SW Pit 4 and off-site via the stormwater channel.</p> <p>Ecological receptors:</p> <p>The concentration of PFOS was reported above the ecological investigation levels nominated. However, the infrastructure sample locations are not considered to represent an environment suitable for aquatic ecosystems.</p> <p>Based on site observations, surface water run off from the site would be expected to follow the site gradient into the stormwater drain which runs perpendicular to the site from the north eastern corner and would eventually flow to Farmers Creek which is located approximately 800 metres north of the Site and discharges into the Coxs River and Lake Lyell.</p>

Media	Summary discussion
Off-site surface water	<p>Surface water sample Drain 1 was collected from the stormwater channel which leads from the site to the north (discharges from sampling location SW Pit 4).</p> <p>Human Health:</p> <p>The recorded concentrations of PFOS + PFHxS are not deemed to present a risk of exposure to humans.</p> <p>The surface water data is consistent with sediment data, which reported a decline in concentration with distance from the site. However, confirmation of this trend to allow for seasonal variation and wet weather events would be required.</p> <p>Ecological receptors:</p> <p>The concentration of PFOS reported in sample Drain 1 was below the nominated ecological investigation levels.</p>

7 Conceptual site model

Based on the information collected in August 2017, the CSM presented in Table 7-1 and Figure 7-1 was developed for potential on-site sources of contamination.

Table 7-1 Refined CSM

Potential Source	Primary pathway	Receptor	Potential linkage
Firefighting foams in the fire training areas	Incidental ingestion of PFAS impacted soils and sediments	Site staff, intrusive maintenance workers site visitors	No – Concentrations of PFAS in all soil and sediment samples on-site were below the nominated health based investigation levels.
		On-site ecological communities	Possible - One soil sample reported a concentration of PFOS exceeding the indirect ESL. Vegetation on-site appeared healthy and did not exhibit any undue signs of distress. However, the indirect ESL accounts for bioaccumulation potential, meaning that PFAS may persist through the food chain if organisms on-site are consumed by predatory species.
	Vertical/horizontal migration of leachate through unsaturated zone	Groundwater – subsequent migration in groundwater (secondary source)	Yes – PFAS impact was reported in groundwater beneath the site, at concentrations exceeding the drinking water criterion at one location (MW1). Further consideration of potential linkage via secondary sources is presented below.

Potential Source	Primary pathway	Receptor	Potential linkage
	Surface runoff and sediment transport	On-site surface waters (including drainage systems – secondary source)	Yes – PFAS impact was reported in surface waters collected from on-site surface water infrastructure and drainage lines (further consideration of potential linkage via secondary sources is presented below).
		Off-site surface waters	Possible – PFAS was reported in off-site surface water sampled from the drainage line down gradient of the site (further consideration of potential linkage via secondary sources is presented below).
SECONDARY SOURCES			
Secondary source - PFAS In surface Water	Incidental ingestion of PFAS impacted surface waters	Site staff and intrusive maintenance workers	Unlikely – whilst concentrations of PFAS were reported above the drinking water guidelines, site personnel are unlikely to come into contact with on-site surface water contained within stormwater infrastructure and drainage lines on a daily basis and the potential for incidental ingestion of this water is considered to be low.
		Ecological communities in surface water receptors down-gradient of the site including Farmers Creek located approximately 800 metres north of the site	Possible – Concentrations of PFAS in surface water at location SW Pit 4, located in the north eastern corner of the site were above the ecological investigation levels. Whilst off-site PFAS concentrations in sample Drain 1 (located down gradient of SW Pit 4) were reported below the ecological investigation levels, the data was reported following a single sampling event from one off site location and further assessment would be required to confirm whether this linkage may be complete and assess for potential seasonal variation.
Secondary source - PFAS in groundwater	Vertical/horizontal migration	Down gradient surface waters recharged by groundwater	Unlikely – based on review of surrounding water courses, it is unlikely that groundwater in the vicinity of the site would discharge to surface water receptors.

Potential Source	Primary pathway	Receptor	Potential linkage
		Abstraction bore (domestic, irrigation and/ or stock use	Possible – Concentrations of PFAS in groundwater at MW1 were reported above the drinking water criteria. Whilst the area is serviced by municipal water supplies, one domestic bore was identified approximately 650 metres to the north of the site (inferred down-gradient) and the potential for un-registered bores used for domestic purposes cannot be discounted.

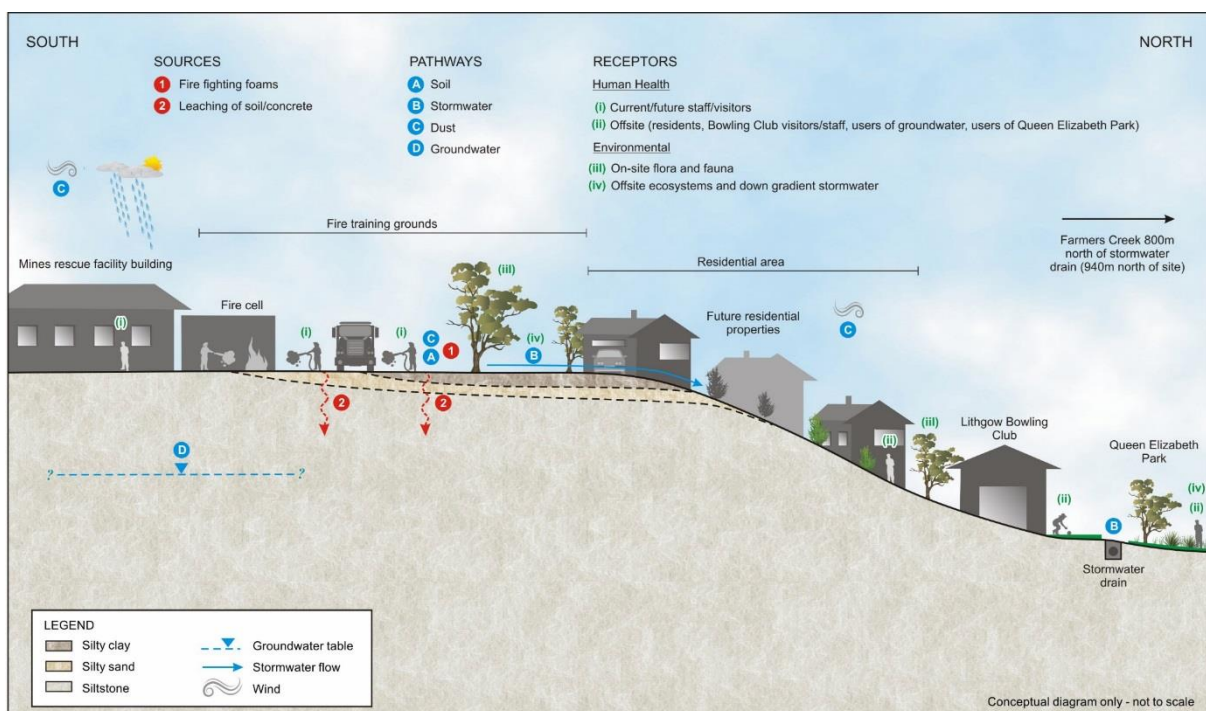


Figure 7-1 Conceptual Site Model

8 Conclusion

With reference to these objectives, and the conceptual site model, the key findings of these works are summarised below:

Objective 1: Potential for PFAS in Groundwater

- PFAS was reported in groundwater at concentrations exceeding the nominated drinking water investigation levels at one location (MW1).
- Groundwater flow direction could not be established as part of these works. However, based on observations made on-site, and local topography, groundwater would be expected to flow in a general northerly direction.
- Based on these results, the extent of PFAS in groundwater in the vicinity of MW1 has not been delineated and PFAS may be migrating off site at concentrations above the drinking water criteria. The closest bore registered for domestic purposes was located approximately 650 metres north of the Site however the potential for un-registered bores which may be used for domestic purposes can not be discounted.

Objective 2: PFAS In soils and sediments

- PFAS was reported in soil samples collected on-site however all samples reported PFAS concentrations which were below the nominated screening criteria for human health indicating that site soils do not present a risk to users of the site under the current land use scenario.
- One shallow soil sample, (MW02 _0.15-0.3) reported a concentration of PFOS which was above the indirect ecological screening criteria for commercial/industrial land use. However, the indirect Ecological Screening Level (ESL) accounts for bioaccumulation potential, meaning that PFAS may persist through the food chain if organisms on-site are consumed by predatory species.
- Concentrations of PFAS in sediment samples collected from on-site surface water infrastructure locations which discharge to both sewer and stormwater were reported below the investigation levels for the protection of both human health and ecological receptors.
- One off-site sediment sample was collected from the drainage channel located down-gradient of the site. PFAS concentrations were lower than those reported on-site and below the nominated human health and ecological investigation levels.
- Leachability testing showed that PFAS impacted soils and sediments entrapped within on-site infrastructure have the potential to release PFAS, however given the concentrations reported, site soils and sediments are not considered to be a significant source of PFAS to groundwater and surface water across the Site.

Objective 3: off-site migration of PFAS via surface water drainage

- Surface water flow is expected to follow the local topography on-site and flow towards the north east. Stormwater is managed by an onsite drainage system and reworked topography to direct surface water to the stormwater system or directly to sewer.
- PFAS was reported in surface water samples collected from on-site infrastructure locations which discharge to both sewer and stormwater.

- Concentrations of PFAS were reported above both human health and ecological criteria.
- One surface water sample was collected from the stormwater drain located down-gradient of the site to the north. PFAS was detected in this sample, however concentrations were lower than those reported on-site and below the nominated human health and ecological criteria.
- There are no surface water bodies located on-site. The nearest surface water feature is a small creek up-gradient of the southern boundary of the site, located approximately 145 m away.

9 Recommendations

Based on the findings of these works, the following recommendations are made:

- Additional groundwater monitoring, including installation of additional monitoring wells to confirm groundwater flow direction and assess the potential for off-site migration of PFAS via groundwater. All wells to be sampled for PFAS and major cations and anions.
- Further sampling of surface water discharging from the Site and in the surrounding area. Investigations should also include wet weather sampling event to assess impacts during wet weather flow and potential for seasonal variation in surface water PFAS concentrations.
- Based on the results of the additional sampling, consideration to complete a survey of water use within the area to better characterise groundwater and surface water use in the area, including understanding of the potential for domestic users of groundwater in proximity of the site.
- Controlled removal of residual sediment from on-site infrastructure collections points.

10 Limitations

This report has been prepared by GHD for Coal Services and may only be used and relied on by Coal Services for the purpose agreed between GHD and the Coal Services as set out in this report.

GHD otherwise disclaims responsibility to any person other than Coal Services arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Where data supplied by Mines Rescue, Coal Services or other external sources, including previous site investigation data and site plans, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by GHD for incomplete or inaccurate data supplied by others.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

Regards



Alison Monkley

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Attachments:

A – Figures

B – Results Summary Tables



Paper Size A4
0 50 100 150 200
Scale (metres)

LEGEND
— Site boundary



Mines Rescue Pty Ltd
Lithgow Mines Rescue Station
3 Proto Avenue, Lithgow, NSW

Site Location

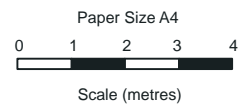
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Revision	0
Date	11 Sep 2017

Figure 1

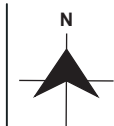


Google™ earth

Image © 2017 CNES/Airbus



LEGEND
 Site boundary

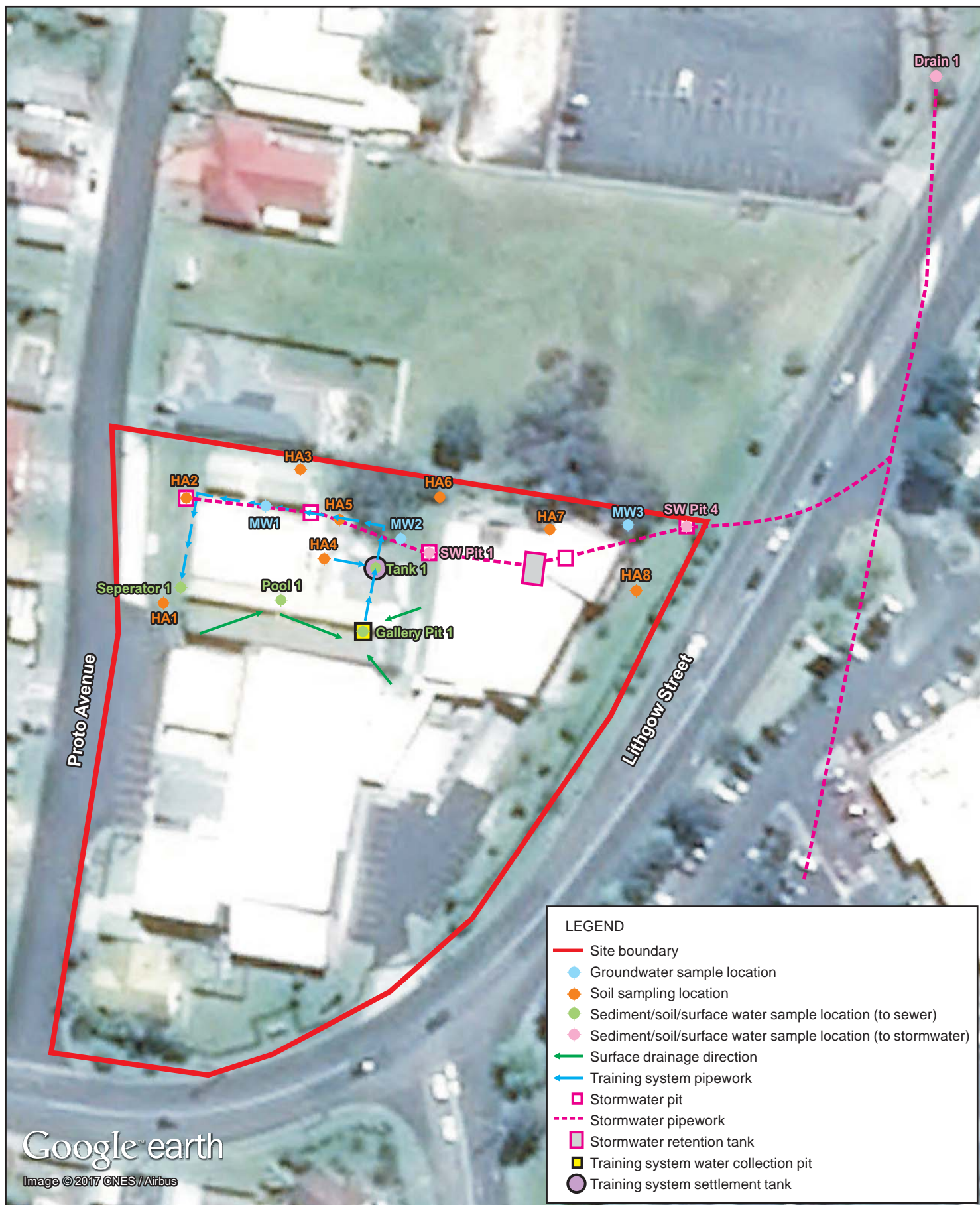


Mines Rescue Pty Ltd
 Lithgow Mines Rescue Station
 3 Proto Avenue, Lithgow, NSW

Site Layout

Job Number	22-19058
Revision	0
Date	11 Sep 2017

Figure 2



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Scale (metres)



Mines Rescue Pty Ltd
Lithgow Mines Rescue Station
3 Proto Avenue, Lithgow, NSW

Job Number	22-19058
Revision	0
Date	11 Sep 2017

Sample Locations

Figure 3



LEGEND

- Groundwater sample location
- Soil sampling location
- Sediment/soil/surface water sample location (to sewer)
- Sediment/soil/surface water sample location (to stormwater)
- Site boundary

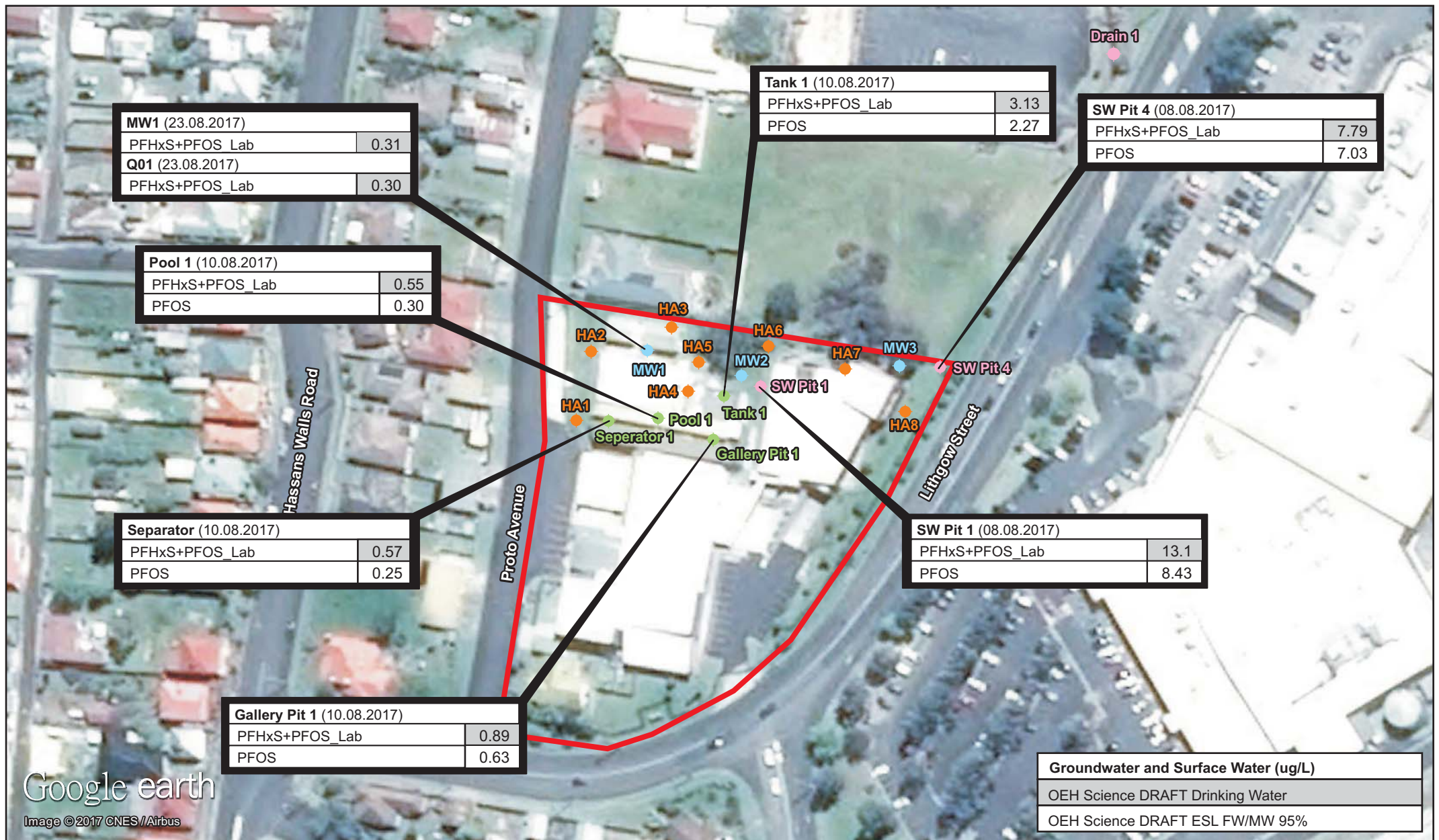


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3 Proto Avenue, Lithgow, NSW

Soil & Sediment Results

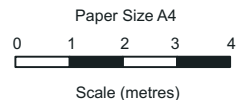
Job Number	22-19058
Revision	0
Date	11 Sep 2017

Figure 4



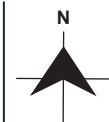
Google earth

Image © 2017 CNES/Airbus



LEGEND

- Groundwater sample location
- Soil sampling location
- Sediment/soi/surface water sample location (to sewer)
- Sediment/soi/surface water sample location (to stormwater)
- Site boundary



Mines Rescue Pty Ltd
Lithgow Mines Rescue Station
3 Proto Avenue, Lithgow, NSW

Groundwater & Surface Water Results

Job Number 22-19058
Revision 0
Date 11 Sep 2017

Figure 5



Mines Rescue Pty Ltd
Western Mines Rescue Station, Lithgow NSW
PFAS Contamination Assessment

Table A
Soil Analytical Results

				PFAS																
				% Moisture	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	Perfluorodecanesulfonic acid (PFDS)	10:2 Fluorotelomer sulfonic acid	Perfluorobutane sulfonic acid	4:2 Fluorotelomer sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	
				%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR			1	0.0002	0.0002	0.0002	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
OEHS Science DRAFT ESL Soil direct Comm./Ind.																				
OEHS Science DRAFT ESL Soil indirect Comm./Ind.																				
OEHS Science DRAFT Soil Comm/ Ind.											20									

Location Code	Date/Time	Field ID																		
HA1	09-Aug-17	HA1 0.0-0.1	29.6	0.0002	<0.0002	<0.0002	0.0046	<0.0002	<0.0005	0.0010	<0.0002	0.0176	0.0081	0.0086	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA2	09-Aug-17	HA2 0.0-0.15	9.7	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0007	<0.0002	0.0030	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA3	09-Aug-17	HA3 0.0-0.1	29.6	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0020	<0.0002	0.0348	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA4	10-Aug-17	HA4 0.05-0.20	18.5	0.0005	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0007	<0.0002	0.0154	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA4	10-Aug-17	FD5	19.0	0.0007	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0011	<0.0002	0.0246	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA5	09-Aug-17	HA5 0.0-0.15	12.9	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0009	<0.0002	0.0105	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA6	10-Aug-17	HA6 0.0-0.2	6.6	<0.0002	0.0003	<0.0002	<0.0005	<0.0002	<0.0005	0.0030	<0.0002	0.0618	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA7	09-Aug-17	HA7 0.0-0.15	18.7	<0.0002	0.0006	<0.0002	<0.0005	0.0002	<0.0005	0.0031	<0.0002	0.0975	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA8	10-Aug-17	HA8 0.0-0.15	13.6	<0.0002	0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0012	<0.0002	0.0564	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW1	09-Aug-17	MW1 0.0-0.2	7.2	<0.0002	<0.0002	<0.0002	<0.0005	0.0008	<0.0005	0.0005	<0.0002	0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW1	09-Aug-17	FD3	7.6	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0006	<0.0002	0.0006	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW1	09-Aug-17	MW1 0.2-0.4	9.8	<0.0002	0.0006	<0.0002	<0.0005	0.0003	<0.0005	0.0074	<0.0002	0.0367	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW2	09-Aug-17	MW2 0.0-0.15	16.3	<0.0002	0.0004	<0.0002	<0.0005	0.0003	<0.0005	0.0026	<0.0002	0.0737	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW2	09-Aug-17	MW2 0.15-0.3	19.0	<0.0002	0.0053	0.0007	<0.0005	0.0016	<0.0005	0.0235	<0.0002	0.720	<0.0002	0.0015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW3	09-Aug-17	MW3 0.0-0.15	8.8	<0.0002	0.0008	<0.0002	<0.0005	<0.0002	<0.0005	0.0034	<0.0002	0.0818	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW3	09-Aug-17	MW3 0.15-0.5	8.2	<0.0002	0.0005	<0.0002	<0.0005	0.0002	<0.0005	0.0034	<0.0002	0.0538	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Internal training system to sewer																				
Pool 1	10-Aug-17	Pool 1	23.4	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	0.0013	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Gallery Pit 1	10-Aug-17	Gallery Pit	21.0	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	0.0012	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Tank 1	10-Aug-17	Tank 1	73.0	<0.0002	0.0009	0.0013	<0.0005	<0.0002	<0.0005	0.0022	<0.0002	0.0407	<0.0002	0.0027	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
External training system to storm water																				
SW Pit 1	10-Aug-17	SW Pit 1	25.5	<0.0002	0.0003	<0.0002	<0.0005	<0.0002	<0.0005	0.0019	<0.0002	0.0579	<0.0002	0.0012	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SW Pit 4	10-Aug-17	SW Pit 4	36.2	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0006	<0.0002	0.0111	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Drain 1	10-Aug-17	Drain 1	70.5	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	0.0004	<0.0002	0.0029	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

13/09/2017



Table A
Soil Analytical Results

			PFAS (continued)															
			6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR			0.0005	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002
OEHS Science DRAFT ESL Soil direct Comm./Ind.				48								60						
OEHS Science DRAFT ESL Soil indirect Comm./Ind.												0.14						
OEHS Science DRAFT Soil Comm/ Ind.				100														

Location Code	Date/Time	Field ID																
HA1	09-Aug-17	HA1 0.0-0.1	0.0091	0.0037	<0.0002	<0.001	0.0030	0.0002	0.0050	0.0035	0.0080	0.0166	<0.0002	<0.0005	<0.0002	0.0011	0.0727	0.0556
HA2	09-Aug-17	HA2 0.0-0.15	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0023	<0.0002	<0.0005	<0.0002	<0.0002	0.0030	0.0030
HA3	09-Aug-17	HA3 0.0-0.1	<0.0005	0.0004	<0.0002	<0.001	<0.0002	<0.0002	0.0002	0.0006	0.0004	0.0328	<0.0002	<0.0005	0.0009	0.0013	0.0386	0.0360
HA4	10-Aug-17	HA4 0.05-0.20	<0.0005	0.0003	<0.0002	<0.001	<0.0002	<0.0002	0.0002	0.0002	0.0003	0.0147	0.0008	<0.0005	<0.0002	0.0003	0.0180	0.0161
HA4	10-Aug-17	FD5	<0.0005	0.0003	<0.0002	<0.001	0.0002	<0.0002	0.0003	0.0002	0.0003	0.0235	0.0006	<0.0005	<0.0002	0.0003	0.0275	0.0254
HA5	09-Aug-17	HA5 0.0-0.15	<0.0005	0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0096	<0.0002	<0.0005	<0.0002	<0.0002	0.0107	0.0107
HA6	10-Aug-17	HA6 0.0-0.2	<0.0005	0.0004	0.0002	<0.001	<0.0002	<0.0002	0.0004	0.0007	0.0005	0.0588	<0.0002	<0.0005	0.0008	0.0006	0.0657	0.0633
HA7	09-Aug-17	HA7 0.0-0.15	<0.0005	0.0009	0.0002	<0.001	0.0010	0.0006	0.0002	0.0005	0.0003	0.0944	<0.0002	<0.0005	<0.0002	<0.0002	0.102	0.0993
HA8	10-Aug-17	HA8 0.0-0.15	<0.0005	0.0006	<0.0002	<0.001	0.0006	<0.0002	<0.0002	0.0004	<0.0002	0.0552	<0.0002	<0.0005	<0.0002	<0.0002	0.0582	0.0574
MW1	09-Aug-17	MW1 0.0-0.2	<0.0005	<0.0002	0.0004	<0.001	<0.0002	<0.0002	0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0027	0.0023
MW1	09-Aug-17	FD3	<0.0005	<0.0002	0.0004	<0.001	<0.0002	<0.0002	0.0002	0.0009	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0021	0.0017
MW1	09-Aug-17	MW1 0.2-0.4	<0.0005	0.0009	0.0003	<0.001	<0.0002	<0.0002	0.0004	0.0009	0.0014	0.0293	<0.0002	<0.0005	0.0004	<0.0002	0.0419	0.0392
MW2	09-Aug-17	MW2 0.0-0.15	<0.0005	0.0005	0.0002	<0.001	0.0003	<0.0002	0.0003	0.0004	0.0004	0.0711	<0.0002	<0.0005	<0.0002	0.0004	0.0769	0.0752
MW2	09-Aug-17	MW2 0.15-0.3	0.0008	0.0040	0.0016	<0.001	0.0021	0.0002	0.0008	0.0018	0.0018	0.697	0.0021	<0.0005	0.0006	0.0015	0.747	0.731
MW3	09-Aug-17	MW3 0.0-0.15	<0.0005	0.0008	<0.0002	<0.001	0.0006	<0.0002	<0.0002	0.0004	0.0003	0.0784	<0.0002	<0.0005	<0.0002	<0.0002	0.0847	0.0830
MW3	09-Aug-17	MW3 0.15-0.5	<0.0005	0.0010	<0.0002	<0.001	<0.0002	<0.0002	0.0003	0.0005	0.0004	0.0504	<0.0002	<0.0005	<0.0002	<0.0002	0.0567	0.0558
Internal training system to sewer																		
Pool 1	10-Aug-17	Pool 1	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.0005	<0.0002	<0.0002	0.0013	0.0013
Gallery Pit 1	10-Aug-17	Gallery Pit	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.0005	<0.0002	<0.0002	0.0012	0.0012
Tank 1	10-Aug-17	Tank 1	0.0125	0.0005	0.0002	<0.001	0.0004	0.0006	0.0003	0.0006	0.0003	0.0385	<0.0002	<0.0005	<0.0002	0.0005	0.0615	0.0573
External training system to storm water																		
SW Pit 1	10-Aug-17	SW Pit 1	<0.0005	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0002	0.0003	0.0560	<0.0002	<0.0005	<0.0002	<0.0002	0.0604	0.0598
SW Pit 4	10-Aug-17	SW Pit 4	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0105	<0.0002	<0.0005	<0.0002	<0.0002	0.0111	0.0111
Drain 1	10-Aug-17	Drain 1	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0025	<0.0002	<0.0005	<0.0002	<0.0002	0.0029	0.0029



Mines Rescue Pty Ltd
Western Mines Rescue Station, Lithgow NSW
PFAS Contamination Assessment

Table B
Groundwater and surface water analytical results

	Field Parameters						PFAS													
	Purge Volume	DO (mg/L) (Field)	Electrical conductivity (field)	pH (Field)	Redox (Field)	Temperature (Field)	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	Perfluorodecanesulfonic acid (PFDS)	10:2 Fluorotelomer sulfonic acid	Perfluorobutane sulfonic acid	4:2 Fluorotelomer sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	N-Methyl perfluorooctane sulfonamidoacetic acid	Perfluoropentanoic acid	PFHxS and PFOS (Sum of Total) + Lab Calc	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide
	L	mg/L	µS/cm	pH Units	mV	°C	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR							0.02	0.02	0.02	0.05	0.02	0.05	0.02	0.02	0.02	0.01	0.05	0.05	0.05	0.05
OEH Science DRAFT Drinking Water																0.07				
OEH Science DRAFT ESL FW/MW 95%																				

Location Code Date/Time Field ID

Groundwater																						
MW1	23-Aug-17	MW1	1.8	1.58	446.5	5.89	126.3	14	<0.02	<0.02	<0.02	<0.05	0.21	<0.05	0.31	<0.02	0.20	0.31	<0.05	<0.05	<0.05	<0.05
MW1	23-Aug-17	Q01	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	0.19	<0.05	0.30	<0.02	0.20	0.30	<0.05	<0.05	<0.05	<0.05
MW2	23-Aug-17	MW2	1.6	0.68	551.5	5.81	91.5	13.9	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05
MW3	23-Aug-17	MW3	2	0.39	279.5	5.87	32.8	16	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05
Internal training system to sewer																						
Pool 1	10-Aug-17	Pool 1	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	0.02	<0.05	0.25	<0.02	0.12	0.55	<0.05	<0.05	<0.05	<0.05
Gallery Pit 1	10-Aug-17	Gallery Pit 1	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	0.02	<0.05	0.26	<0.02	0.15	0.89	<0.05	<0.05	<0.05	<0.05
Tank 1	10-Aug-17	Tank 1	-	-	-	-	-	-	<0.02	0.06	<0.02	<0.05	0.12	<0.05	0.86	<0.02	0.25	3.13	<0.05	<0.05	<0.05	<0.05
Separator 1	10-Aug-17	Separator 1	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	0.06	<0.05	0.32	<0.02	0.10	0.57	<0.05	<0.05	<0.05	<0.05
External training system to stormwater																						
SW Pit 1	08-Aug-17	SW Pit 1	-	-	-	-	-	-	<0.02	0.26	<0.02	<0.05	0.95	<0.05	4.70	<0.02	0.94	13.1	<0.05	<0.05	<0.05	<0.05
SW Pit 4	08-Aug-17	SW Pit 4	-	-	-	-	-	-	<0.02	0.06	<0.02	<0.05	0.12	<0.05	0.76	<0.02	<0.02	7.79	<0.05	<0.05	<0.05	<0.05
Drain 1	08-Aug-17	Drain 1	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.02	<0.02	0.02	<0.05	<0.05	<0.05	<0.05

26/09/2017



Table B
Groundwater and surface water analytical results

	PFAS (continued)																
	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (sum of Total)	PFAS (sum of Total)(WA DER List)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
OEH Science DRAFT Drinking Water			0.56														
OEH Science DRAFT ESL FW/MW 95%			220								0.13						

Location Code Date/Time Field ID

Groundwater																			
MW1	23-Aug-17	MW1	<0.05	<0.05	0.01	0.16	<0.1	<0.02	<0.02	0.05	0.33	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	1.27	1.11
MW1	23-Aug-17	Q01	<0.05	<0.05	0.01	0.16	<0.1	<0.02	<0.02	0.06	0.32	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	1.24	1.08
MW2	23-Aug-17	MW2	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	0.03	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	0.03	0.03
MW3	23-Aug-17	MW3	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
Internal training system to sewer																			
Pool 1	10-Aug-17	Pool 1	<0.05	<0.05	0.06	0.03	<0.1	<0.02	<0.02	0.04	0.08	<0.02	0.30	<0.02	<0.05	<0.02	<0.02	0.90	0.87
Gallery Pit 1	10-Aug-17	Gallery Pit 1	<0.05	0.06	0.10	0.02	<0.1	<0.02	<0.02	0.06	0.10	0.03	0.63	<0.02	<0.05	<0.02	<0.02	1.43	1.38
Tank 1	10-Aug-17	Tank 1	<0.05	0.14	0.12	0.13	<0.1	<0.02	<0.02	0.09	0.22	0.02	2.27	<0.02	<0.05	<0.02	<0.02	4.28	4.07
Separator 1	10-Aug-17	Separator 1	<0.05	0.25	0.04	0.06	<0.1	<0.02	<0.02	0.05	0.13	<0.02	0.25	<0.02	<0.05	<0.02	<0.02	1.26	1.20
External training system to stormwater																			
SW Pit 1	08-Aug-17	SW Pit 1	<0.05	0.19	0.50	0.92	<0.1	<0.02	<0.02	0.37	1.13	0.06	8.43	<0.02	<0.05	<0.02	<0.02	18.4	17.2
SW Pit 4	08-Aug-17	SW Pit 4	<0.05	<0.05	0.08	0.11	<0.1	<0.02	<0.02	0.05	0.13	0.02	7.03	<0.02	<0.05	<0.02	<0.02	8.36	8.17
Drain 1	08-Aug-17	Drain 1	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.0	0.02	<0.02	<0.05	<0.02	<0.02	0.02	0.02



Table C
Analytical Results Summary- Leachate

Mines Rescue Pty Ltd
Western Mines Rescue Station, Lithgow NSW
PFAS Contamination Assessment

	pH (Final)	PFAS														
		N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorooheptane sulfonic acid	Perfluorodecanesulfonic acid (PFDS)	10:2 Fluorotelomer sulfonic acid	Perfluorobutane sulfonic acid	4:2 Fluorotelomer sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol
LOR	pH Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
NSW EPA 2016 EnRisks surface water Trigger point 1																
NSW EPA 2016 EnRisks surface water Trigger point 2																
NSW EPA 2016 EnRisks surface water Trigger point 3																

Location

Code Date/Time Field ID

HA1	09-Aug-17	HA1_0.0-0.1	6.5	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	0.04	<0.02	0.27	0.32	<0.05	<0.05	<0.05	<0.05	<0.05
HA7	09-Aug-17	HA7_0.0-0.15	6.4	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	0.10	<0.02	2.25	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05
MW2	09-Aug-17	MW2_0.15-0.3	7.4	<0.02	0.22	0.03	<0.05	0.05	<0.05	0.95	<0.02	26.4	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05
MW3	09-Aug-17	MW3_0.0-0.15	6.7	<0.02	0.04	<0.02	<0.05	<0.02	<0.05	0.17	<0.02	2.63	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05
Onsite water collection systems																		
SW Pit 1	10-Aug-17	SW PIT 1	8.4	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	0.13	<0.02	1.86	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05
Tank 1	10-Aug-17	TANK 1	9.2	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	0.03	<0.02	0.30	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05

13/09/2017



Table C
Analytical Results Summary- Leachate

Mines Rescue Pty Ltd
Western Mines Rescue Station, Lithgow NSW
PFAS Contamination Assessment

	PFAS (continued)															
	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total) (WA DER List)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
NSW EPA 2016 EnRisks surface water Trigger point 1															10	10
NSW EPA 2016 EnRisks surface water Trigger point 2															0.1	0.1
NSW EPA 2016 EnRisks surface water Trigger point 3															0.05	0.05

Location

Code Date/Time Field ID

HA1	09-Aug-17	HA1_0.0-0.1	<0.05	0.09	<0.02	<0.1	<0.02	<0.02	0.15	0.18	0.12	0.23	<0.02	<0.05	<0.02	<0.02	1.13	1.01
HA7	09-Aug-17	HA7_0.0-0.15	<0.05	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	2.15	<0.02	<0.05	<0.02	<0.02	2.27	2.27
MW2	09-Aug-17	MW2_0.15-0.3	<0.05	0.10	0.06	<0.1	0.03	<0.02	<0.02	0.07	0.05	25.4	0.03	<0.05	<0.02	<0.02	27.0	26.6
MW3	09-Aug-17	MW3_0.0-0.15	<0.05	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	2.46	<0.02	<0.05	<0.02	<0.02	2.69	2.65
Onsite water collection systems																		
SW Pit 1	10-Aug-17	SW PIT 1	<0.05	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	1.73	<0.02	<0.05	<0.02	<0.02	1.87	1.87
Tank 1	10-Aug-17	TANK 1	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.27	<0.02	<0.05	<0.02	<0.02	0.30	0.30

13/09/2017



Table D
QA/QC summary - Duplicates

	PFAS																	
	% Moisture	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	Perfluorodecanesulfonic acid (PFDS)	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	Perfluorobutane sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	Perfluorohexane sulfonic acid (PFHxS)	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	
	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
LOR	1	0.0002	0.0002	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	

Location

Code	Date/Time	Field ID																
MW1	09-Aug-17	MW1_0.0-0.2	7.2	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	0.0008	<0.0002	0.0005	0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
MW1	09-Aug-17	FD3	7.6	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	0.0006	0.0006	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
RPD			5	0	0	0	0	0	120	0	18	-	0	0	0	0	0	0
HA4	10-Aug-17	HA4_0.05-0.20	18.5	0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	0.0007	0.0154	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
HA4	10-Aug-17	FD5	19.0	0.0007	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	0.0011	0.0246	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
RPD			3	33	0	0	0	0	0	0	44	-	0	0	0	0	0	0

			%	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR	1	0.02	0.02	0.02	0.05	0.05	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.05	0.05	0.05	0.05	0.05
MW1	23-Aug-17	MW1	-	<0.02	<0.02	<0.02	<0.05	<0.05	0.21	<0.02	0.31	0.31	0.20	<0.05	<0.05	<0.05	<0.05	<0.05
MW1	23-Aug-17	Q01	-	<0.02	<0.02	<0.02	<0.05	<0.05	0.19	<0.02	0.30	0.30	0.20	<0.05	<0.05	<0.05	<0.05	<0.05
RPD			-	0	0	0	0	0	10	0	3	3	0	0	0	0	0	0



Table D
QA/QC summary - Duplicates

	PFAS (continued)														
	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002

Location

Code	Date/Time	Field ID														
MW1	09-Aug-17	MW1_0.0-0.2	<0.0002	0.0004	<0.001	<0.0002	<0.0002	0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0027
MW1	09-Aug-17	FD3	<0.0002	0.0004	<0.001	<0.0002	<0.0002	0.0002	0.0009	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0021
RPD			0	0	0	0	0	0	12	0	0	0	0	0	0	-
HA4	10-Aug-17	HA4_0.05-0.20	0.0003	<0.0002	<0.001	<0.0002	<0.0002	0.0002	0.0002	0.0003	0.0147	0.0008	<0.0005	<0.0002	0.0003	0.0180
HA4	10-Aug-17	FD5	0.0003	<0.0002	<0.001	<0.0002	<0.0002	0.0003	0.0002	0.0003	0.0235	0.0006	<0.0005	<0.0002	0.0003	0.0275
RPD			0	0	0	0	0	40	0	0	46	29	0	0	0	-

			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR			0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01
MW1	23-Aug-17	MW1	0.01	0.16	<0.1	<0.02	<0.02	0.05	0.33	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	1.27
MW1	23-Aug-17	Q01	0.01	0.16	<0.1	<0.02	<0.02	0.06	0.32	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	1.24
RPD			0	0	0	0	0	18	3	0	0	0	0	0	0	2



Table E
Analytical Results Summary - Blanks

Mines Rescue Pty Ltd
Western Mines Rescue Station, Lithgow NSW
PFAS Contamination Assessment

PFAS																
N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	Perfluorodecanesulfonic acid (PFDS)	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	Perfluorobutane sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	Perfluorohexane sulfonic acid (PFHxS)	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

Date/Time Field ID Sample Type

08-Aug-17	TB1	Trip Blank	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01
09-Aug-17	RB1	Rinsate	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01
23-Aug-17	TB01	Trip Blank	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01



Table E
Analytical Results Summary - Blanks

Mines Rescue Pty Ltd
Western Mines Rescue Station, Lithgow NSW
PFAS Contamination Assessment

PFAS (continued)													
Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

Date/Time Field ID Sample Type

08-Aug-17	TB1	Trip Blank	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
09-Aug-17	RB1	Rinsate	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
23-Aug-17	TB01	Trip Blank	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01